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Soil Survey

of

Iron County, Michigan

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Bureau of Chemistry and Soils

In cooperation with the
Michigan Agricultural Experiment Station and the
Michigan Department of Conservation

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SOIL SURVEY OF IRON COUNTY, MICHIGAN

By Z. C. FOSTER, United States Department of Agriculture, in Charge,
J. O. VEATCH, Michigan Agricultural Experiment Station, and
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COUNTY SURVEYED

Iron County is in the western part of the Upper Peninsula of Michigan, bordering the State of Wisconsin (fig. 1). It is in the Menominee Iron Range. Crystal Falls, the county seat, is about 350 miles north of Chicago by highway. The total land area of the county is 1,174 square miles, or 751,360 acres.

The land features are largely a product of glaciation. A thin covering of glacial drift overlies preglacial rock formations. The surface features exhibit the constructional relief characteristic of glaciated areas of northern United States. The general effect is that of a high plain, including broadly rolling hills, depressions, and valleys, locally interrupted by sharply rising rounded hills and rock outcrops, together with many lakes and swamps scattered here and there. Streams are comparatively few.

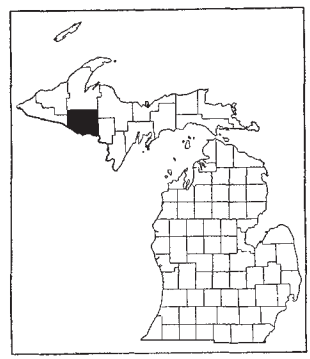

FIGURE 1.—Sketch map showing location of Iron County, Mich.

Although there are no large geographical divisions having great differences in elevation, local diversity in the land surface exists. This can best be seen by a study of figure 2, in which the county is divided into the following natural land divisions, each representing a definite association of natural features:[1]

Division R is marked by broadly rolling drumloid hills with the crests of the hills on nearly the same level.

Divisions P and G are level plains areas locally pitted with depressions and glacial drainageways and including a comparatively small percentage of swamps. The general elevation of these areas ranges from 50 to 200 feet below that of the surrounding hilly country.

Division T is a hilly and knobby area characterized by irregular ridges, knolls, and broad swells with gentle or moderately steep slopes enclosing basins, many of which are swampy.

Division S is a nearly level or undulating area with a high water table. It includes many small poorly drained depressions and in general is excessively stony.

[1] This map was supplied by the Michigan Land Economic Survey.

Division Q is a rolling area lying from 1,700 to 1,800 feet above sea level, in which swamps occur in comparatively large bodies.

Division H is an undulating or gently rolling area including level swamp areas, chiefly of organic soils.

Division X includes smooth or rugged hilly areas, with rock outcrop comprising from 40 to 70 percent of the land. Bare rock knobs and steep sharp slopes are characteristic of these areas.

Division O is comprised of hilly or knobby areas characterized by ridges and knolls with moderately steep slopes, enclosing dry sandy basins.

The greater part of the county lies at an elevation ranging from 1,500 to 1,700 feet above sea level or approximately 900 to 1,100 feet above the level of Lake Superior. The elevation of the plains south and east of Crystal Falls averages about 1,350 feet above sea level. The highest elevations are but little more than 1,800 feet and the lowest less than 1,200 feet. Sheridan Hill southwest of Iron River reaches a height of 1,840 feet.

The headwaters of Paint River are in sections of the county where the elevation is more than 1,600 feet, and the elevation at the mouth of this river is less than 1,200 feet.

The small rivers and streams of this county are the headwaters of Menominee River which drains about 4,100 square miles in Michigan and Wisconsin and empties into Green Bay. Brule River drains the southwestern part of the county. It constitutes the boundary between Michigan and Wisconsin to the point where it joins Paint River to form Menominee River. Paint River and its tributaries drain the western, north-central, and central parts, and Michigamme River drains the eastern part. Most of the streams are swift-flowing. Many rapids and a few cascades occur in places where the rivers flow through narrow valleys bordered by rock cliffs. The main streams and most of the tributaries are perennial in flow, and, as they originate in lakes and swamps, they carry clear water.

There are about 200 lakes in this county, ranging from small circular ponds to lakes covering from 100 to 1,100 acres. Some have a mucky bottom and are surrounded by marshes and swamps, but the majority have sandy or stony beds and high banks, on which various quantities of hardwood timber grow.

Water for drinking purposes is difficult to obtain in those parts of the county underlain by rock at a slight depth. Drilled wells are expensive, and the source of water is not everywhere permanent.

The swamps and wet lands, which occur in both large and small bodies, are widely distributed. For the most part they occupy depressions and old glacial valleys, in which underdrainage is retarded by a compact clayey subsoil or by rock beds. The total area of swamp and permanently wet land occupies about 20 percent of the county.

A dense forest originally covered the entire area, and a few large tracts of virgin hardwood forest remain (pl. 1, *A*). Several types of forest or tree associations were represented in the original forest, four of which were characteristic and dominant: (1) The hardwood forests in which hard maple and yellow birch predominated, with smaller proportions of basswood, ash, elm, and hemlock,

a few balsam and spruce, and scattered large white pine; (2) the mixed hardwood and coniferous forest, in which the common hardwoods were intimately mixed with white pine and contained a higher percentage of hemlock, balsam fir, and white spruce; (3) the pine forests, in which white pine, Norway pine, or Norway pine and jack pine predominated; and (4) the swamp forests, in some of which cedar, ash, elm, and white birch dominated, and those in which black spruce and tamarack dominated.

The first white settlers came to this section of Michigan in 1843, primarily to engage in fur trading. Lumbering operations began between 1850 and 1870. Iron ore was discovered in 1851 by Harry Mellon, United States land surveyor. Iron County was organized from parts of Marquette and Menominee Counties in 1885. The first mine began operations in 1881, and the first railroad was completed in 1882.[2]

The population in 1930 was 20,805 of which 13,145 were classed as rural, with a density of 11 persons a square mile. A large part of the population is foreign born or consists of children of foreign-born parents, principally Swedes, Finns, Poles, and people from other European countries and from Canada.

Crystal Falls has a population of 2,995, Iron River has 4,665, and Stambaugh has 2,400. Most of the towns are located near mines or mining centers. Iron River, Stambaugh, Caspian, and Gaastra, though separate municipalities, are in reality one continuous town and form the center of population. Other small towns serve as shipping points.

The county is served by two railroads, the Chicago & North Western and the Chicago, Milwaukee, St. Paul & Pacific. No main lines run through this county, but good connections are made, especially to Chicago. Two United States highways cross the county, one from east to west and the other from north to south. Good gravel roads connect the different communities with each other and with the main roads. The schools and churches are excellent. Electric-power lines cross the county, serving most of the towns; and many farmers have installed electricity.

In order of their economic value, mining, lumbering, and agriculture are the important industries. Lumbering was the first industry of importance. As soon as the county was surveyed and operators could buy land from the Government, they began to remove the pine timber. Following removal of the pines, lumbering of the hardwoods began. This has been more gradual, and there still are large tracts of virgin hardwood timber. Besides the regular men, or lumberjacks, employed in this industry, many farmers increase their income by working in the woods during the winter. The logs are shipped to distant mills, as there are no large sawmills located in this county. Timber not suited for logs is made into crossties, pulpwood, and cordwood.

Although iron ore was discovered in 1851, it was not until 1881 that the first mine began operations. In 1929 there were 23 mines in

[2] SAWYER, A. L. A HISTORY OF THE NORTHERN PENINSULA OF MICHIGAN, AND ITS PEOPLE; ITS MINING, LUMBER AND AGRICULTURE INDUSTRIES. V. 1, pp. 518–536. Chicago. 1911.

operation, with a total output of 3,674,011 gross tons of iron ore having a value of $4.03 a ton, or a total value of $14,819,490.77. By comparing this with the total value ($1,413,218) of agricultural products, which includes all livestock and livestock products, in 1929, an idea of the economic relationships of the two industries is shown. About 3,000 men are employed in the mines. The ore is shipped to distant points, mainly through Escanaba, in Delta County, where it is loaded on boats.[3]

The large areas of wild country and the many lakes and streams afford good hunting and fishing. These, combined with the natural beauty of the country, attract many visitors, and caring for tourists has taken on the aspect of an industry.

CLIMATE

The most outstanding climatic features are a mean annual temperature of 39.2° F., an average annual precipitation of 33.72 inches, an average annual snowfall of 56.5 inches, low humidity, low percentage of sunshine, low wind movement, and low evaporation.

The winters are of long duration, and many of them are extremely rigorous. Normally the mean temperature is below freezing from November until April, and a minimum of −47° F. has been recorded. The period of warm weather is correspondingly short and is characterized by moderate temperatures, with a seasonal average from June to August of 62.7°.

The average length of the frost-free season is about 90 days, from June 10 to September 7, and light frosts, damaging to tender vegetation, may occur even between these dates. Only very local differences are noticed in the effects of frost, and these are caused by differences of elevation or protection from winds.

Precipitation is highest during the summer, with an average of 12.25 inches. This amount of rainfall, together with low humidity and low evaporation, is ample for the production of the staple crops and also tends to produce a luxuriant forest growth. Precipitation rarely falls as destructive downpours but for the most part as slow rains, allowing the soil to absorb much of the moisture.

The snowfall, which generally forms a permanent covering for a period of 5 or 6 months, from November to April, inclusive, prevents deep freezing of the soil and protects the grain and hay crops.

Table 1, compiled from records of the United States Weather Bureau station at Iron River, gives the more important climatic data for this county.

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[3] General statistics covering costs and production of Michigan iron mines are provided by F. C. Pardee and W. Osgood, of the Geological Survey Division, Michigan Department of Conservation.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Iron River, Iron County, Mich.*

[Elevation, 1,504 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1921)	Total amount for the wettest year (1911)	Snow, average depth
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Inches*
December	16.7	56	−34	1.52	2.20	4.08	11.1
January	10.6	53	−43	1.32	.60	1.70	9.7
February	11.7	64	−47	1.39	.40	3.10	11.3
Winter	13.0	64	−47	4.23	3.20	8.88	32.1
March	24.2	83	−30	2.06	2.45	3.30	11.4
April	39.1	85	−12	2.85	4.74	1.10	4.3
May	51.2	94	10	3.47	1.28	8.70	.4
Spring	38.2	94	−30	8.38	8.47	13.10	16.1
June	60.6	98	23	4.22	1.70	4.80	.0
July	65.1	100	28	4.32	3.20	9.79	.0
August	62.5	93	26	3.71	2.84	6.30	.0
Summer	62.7	100	23	12.25	7.74	20.89	.0
September	55.3	96	15	3.88	3.45	3.80	(1)
October	44.0	84	4	2.93	.88	4.90	.4
November	29.9	70	−17	2.05	.30	3.50	7.9
Fall	43.1	96	−17	8.86	4.63	12.20	8.3
Year	39.2	100	−47	33.72	24.04	55.07	56.5

[1] Trace.

AGRICULTURE

The first agricultural development was primarily due to the development of a local market for agricultural products. The dense forests and rocky character of the soil did not offer much encouragement for agriculture, but, as lumbering progressed, the need for fresh vegetables in the camps and the profit derived from supplying hay and feed for work animals led to the clearing and cultivating of small plots of ground. Increased activity in lumbering and the development of the iron-ore industry gradually increased the population, and consequently there was an increased demand for agricultural products.

Prior to 1890 there was not much agricultural development, as the census reports of that year show that there were only 32 farms with a total acreage of 4,562 acres. There has been a steady increase in the number of farms, and 801 are reported in the 1930 census. The greatest increase occurred between the years 1910 and 1930. Although there has been a steady increase in the number of farms, the area reported in crops in 1929 was only 2½ percent of the total area of the county. About 8 percent of the land is owned as farm land.

Agricultural development has been confined largely to the southern part of the county, adjacent to small towns or in close proximity to the centers of population, as around Iron River, Crystal Falls, and Amasa, and in a few outlying localities, as the Mansfield settle-

ment and the settlements south of Gibbs City. In the northern and extreme southwestern parts, extensive tracts of virgin forest still remain, and there are entire townships in which no agricultural development has been undertaken.

Hay, oats, wheat, barley, and potatoes are the principal crops grown. Other crops, as peas, sunflowers, alfalfa, and rutabagas are grown on a small scale in a more or less experimental way. Raspberries in abundance grow wild. Apples are the main orchard fruit, and plums and cherries yield well in favorable years. Cabbage, onions, and lettuce are the principal garden vegetables.

A mixture of timothy and red, or June, clover constitutes the chief hay crop, but very little timothy or clover is grown alone. A few acres are devoted to alfalfa, and grains are sometimes cut green for hay. The combined acreage of all hay crops in 1929 was 16,636 acres, and the yield averaged about 1⅓ tons an acre. The greater part of this was a timothy and clover mixture.

Oats are a reasonably sure crop, and they are grown for local consumption. The average yield is about 35 bushels an acre, although yields ranging from 60 to 70 bushels have been reported. Wolverine and Iogold are the most popular varieties. Iogold, although not producing quite such high yields as the Wolverine variety, is not susceptible to rust.

Barley yields about 25 bushels an acre. Spartan and Wisconsin Pedigreed No. 5 give the best returns.

Potatoes may be regarded a fairly dependable cash crop. Rural Russet is the most popular variety. Potatoes of excellent quality are grown, and good yields are obtained. The average yield, according to census reports, is 125 bushels an acre, but yields exceeding 200 bushels are not uncommon.

Corn is not grown with any degree of success. Sunflowers are grown for silage with peas, and the yield is about 14 tons an acre.

The use of commercial fertilizers has been restricted principally to the potato crop. In 1929, 37 farms reported the expenditure of $4,552 for fertilizers. The favorite formula used is a 2–12–6 or 4–16–4.[4] The use of lime is being experimented with at present.

The farmers do most of their own work and hire extra labor only for the short harvest period. The laborers are obtained locally, and their wages are controlled largely by the prevailing wages in the iron mines.

The average size of farms has decreased from 143 acres in 1890 to 78 acres in 1930, but the average number of acres of improved land a farm has remained fairly constant. The farms range in size from a large ranch of several thousand acres to 5- and 10-acre tracts.

In 1930, 94.5 percent of the farms were operated by owners, 5.2 percent by tenants, and 0.3 percent by managers. The tenants operate the farms for a part of the proceeds.

Most of the farms have modern frame houses and barns, which are well kept up. Electricity, for light and power, has been installed on many farms along electric lines. On the larger farms, tractors with the necessary equipment are used extensively. Modern machinery is in general use on the farms, and the greater number of

[4] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

farmers take care to store their equipment under cover during the winter. Horses are the only work animals used. Heavy draft horses that can be used in the woods in winter are the most popular. Grade Holstein-Friesians and Guernseys are the more popular dairy cattle, and the dominant beef breed is Hereford. A few beef cattle are fattened and shipped. Sheep are raised on many farms. There is plenty of summer pasture where brush and trees are cleared.

The development of agricultural pursuits is controlled by climate, soils, shipping facilities, distance to markets, and local needs. In Iron County dairying is the most important agricultural pursuit. The value of dairy products increased from $36,448 in 1909 to $273,643 in 1929. The dairy herds are gradually being built up through the acquirement of more than 100 purebred sires. Most of the dairy products are consumed locally as raw milk or butter. The cooperative creamery located at Iron River ships butter to outside markets.

Poultry is kept on most farms, but few farms are devoted exclusively to poultry raising. Egg production is the main object, and breeds of poultry noted for their egg-producing capabilities are in the majority, with the White Leghorn variety leading. Up-to-date poultry houses are being built. Young chicks are shipped in from outside hatcheries. The value of poultry and eggs produced in 1929 was $123,410.

Agricultural methods and management in Iron County are typical of the general practice in this section. A bulletin issued by the Michigan Agricultural Experiment Station [5] discusses all branches of agriculture and gives recommendations as to cultural methods, varieties of grains, crop rotations, fertilization of crops, and the production and care of livestock. Close cooperation with the county agricultural agent and with the workers in the Upper Peninsula Experiment Station, at Chatham, will acquaint the farmer with any new and successful methods of farm management.

SOILS AND CROPS

The surface soils of the soils in Iron County range in texture from fine sands to silt loams. The soils of the rolling or hilly lands are stony to varying degrees, and, except on the level sand plains, the cost of picking stones is a factor to be considered when clearing new land. Some soils, and most soils in places, are stony to such a degree that they are unsuited to cultivated crops.

All the soils are acid in the surface soil, and only two small areas were found in which they were not acid to a depth of several feet.

The crops grown in Iron County consist only of the more staple hardy crops which will withstand a rigorous winter or will mature during the short growing season—June to August, inclusive. Hay, oats, barley, sunflowers, and potatoes are the most successfully grown crops, and they are produced in all parts of the county where farming is carried on.

About 96 percent of the land is forested or cut-over land. It is only on a few soils that any farming is carried on. Consequently,

[5] WESTON, J. W., MCMILLAN, D. L., and PUTNAM, G. W. THE AGRICULTURE OF THE UPPER PENINSULA; ITS PRESENT DEVELOPMENT AND POSSIBILITIES. Mich. Agr. Expt. Sta. Spec. Bull. 116, 82 pp., illus. 1922.

in grouping and discussing the various soils, a discussion of the relation of forest trees and their growth to soils will dominate over a discussion of the adaptation of the soils to farm crops.

For the purpose of mapping, soils are classified in soil series on the basis of such characteristics as color, structure, and composition of parent material, and the series are divided into types on the basis of differences in texture of the surface soil.

The soil series of this county may be grouped, on the basis of broad similarity of subsoils and drainage, into (1) soils having heavy or medium-heavy substrata; (2) soils having coarse sandy, gravelly, and cobbly subsoils; (3) sandy soils; (4) soils of the stream bottoms; (5) poorly drained or marsh-border soils; and (6) muck and peat soils.

In the following pages, the soils of Iron County are described in detail, and their agricultural relationships are discussed; their location and distribution are shown on the accompanying soil map; and their acreage and proportionate extent are given in table 2.

TABLE 2.—*Acreage and proportionate extent of the soils mapped in Iron County, Mich.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Iron River silt loam	127,360	17.0	Vilas loamy sand	7,232	1.0
Iron River loam	96,384	12.8	Brule loam	4,224	.6
Hiawatha fine sandy loam	76,096	10.1	Brule loam, gray phase	768	.1
Munising loam	17,152	2.3	Kerston muck	4,032	.5
Baraga loam	54,784	7.3	Channing fine sandy loam	20,288	2.7
Trenary loam	832	.1	Gaastra silt loam	17,856	2.4
Negaunee silt loam	640	.1	Adolph loam	12,096	1.6
Stambaugh silt loam	12,096	1.6	Adolph silt loam	4,608	.6
Stambaugh loam	23,232	3.0	Diana stony loam	4,096	.5
Kalkaska sandy loam	768	.1	Carbondale muck	62,720	8.3
Amasa very fine sandy loam	21,824	2.9	Spalding peat	54,272	7.2
Emmert stony sandy loam	5,440	.7	Greenwood peat	4,288	.6
Rough stony land	19,456	2.6	Dawson peat	11,392	1.5
Rubicon fine sandy loam	40,704	5.4	Houghton muck	6,976	.9
Rubicon sand	21,760	2.9	Tahquamenon peat	832	.1
Omega loamy sand	3,520	.5	Made land	448	.1
Randville fine sandy loam	4,224	.6	Mine pits	64	.1
Vilas sand	8,896	1.2	Total	751,360	

SOILS HAVING HEAVY OR MEDIUM-HEAVY SUBSTRATA

The combined area of these soils represents about 49.5 percent of the total area of the county. The dominant forest cover is hardwoods. The soils range from well drained to moderately well drained and from nearly level or broadly rolling to hilly. Stones and boulders occur on the surface and throughout the soil profile in varying degrees, the quantity being excessive in places and slight in others. Most of these soils are acid to a depth of several feet.

The Iron River soils where cultivated are characterized by silty or loamy buff-colored surface soils overlying loose reddish-brown gravelly bouldery subsoils which contain a high percentage of dark-colored rock material. The Munising and Hiawatha soils have a gently rolling or knobby surface relief, are moderately pervious and penetrable throughout, and have reddish-brown sandy loam subsoils. Potholes and depressions are characteristic features. The Baraga soils are characterized by a gray compact substratum, a high percentage of

angular dark-colored rock fragments on the surface and throughout the soil, and numerous small poorly drained areas caused by the impervious character of the substratum or slight depth to bedrock.

Trenary loam, the only type of the Trenary series mapped, is characterized by a neutral or alkaline subsoil which contains limestone rock fragments.

Negaunee silt loam has a deep red clayey subsoil, whereas the underlying drift is composed largely of hematitic schist fragments and other highly ferruginous rocks.

Iron River silt loam.—Iron River silt loam occupies large uniform areas of the nearly level or broadly rolling lands in the southwestern part of the county and to some extent in the northeastern and east-central parts.

Where cultivated the 6- or 8-inch surface soil is brown mellow friable silt loam which works easily and does not have a tendency to crust. It is underlain by loose silt loam which is buff or tan colored in the upper part and grades downward into pale-yellow and gray silt loam. This material rests on compact reddish-brown sandy clay till at a depth ranging from 2 to 3 feet.

Under forested conditions the soil has the following layers: (1) 2 or 3 inches of forest litter, mold, and humus; (2) 3 or 4 inches of lavender-gray floury silt loam; (3) 15 to 18 inches of pale-buff or yellow mellow friable silt loam; (4) 10 to 12 inches of pale-yellow and gray silt loam; (5) 9 to 12 inches of a compact reddish-brown sandy clay mixture containing numerous schist fragments; and (6) medium heavy sandy bouldery reddish-brown till.

Variations in the thickness of the silty material over the till substratum occur. The average depth is about 3 feet, in a few small local areas it reaches a depth ranging from 4 to 5 feet, and in other places on the upper slopes of hills and crests of more roughly rolling hills it is shallower, ranging from 1 to 2 feet in thickness. In the northeastern and east-central parts of the county, the surface soil in general contains a higher percentage of very fine sand and the subsoil has a more reddish-gray color, compared with the normal reddish-brown color.

The moisture content of this soil is kept fairly constant by the generally rolling surface relief and the porous character of the substratum, which provides drainage for excess moisture during rainy periods; and by the retentiveness of the silty surface soil which tends to retain moisture during dry periods.

Stones and boulders are present on the surface and throughout the profile, and in places the surface is covered to such an extent as to make clearing of the land difficult.

This is a fertile soil, and many good farms are located on it, especially near the towns of Iron River and Stambaugh. Hay (timothy and clover), oats, barley, sunflowers, and potatoes are the principal crops. Peas are planted with sunflowers to some extent. Rutabagas are grown for cow feed. Garden vegetables are grown only for home consumption. Yields of hay average about 1½ tons an acre; oats about 40 bushels, with some yields as high as 70 or 80 bushels being reported; barley about 25 bushels; and sunflowers, cut for silage, about 16 tons.

Iron River silt loam originally supported a dense thrifty growth of hardwoods, with hard maple as the dominant species. Yellow

birch, basswood, elm, ash, balsam fir, hemlock, and a few large white pine were the subdominant species. Tracts of this virgin timber still remain. The reproduction on cut-over areas is largely maple, with some of the other original species. In open areas or areas in which the young growth is scattered, a good growth of grass flourishes. Burned-over areas support a thrifty growth of poplar (quaking aspen, and largetooth aspen. Both of the aspens are locally called "popple").

Iron River loam.—Iron River loam occurs in the same general location as Iron River silt loam. The difference between these two soils lies in the more sandy gravelly character of the surface soil of the loam and the fact that the surface soil is more shallow over the coarse cobbly gravelly subsoil.

The plowed surface soil, to a depth of 6 or 8 inches, is brown silty loam or very fine sandy loam. This is underlain by buff-colored gravelly silty loam which continues to a depth ranging from 20 to 24 inches. This layer, in turn, rests on grayish-brown compact sandy loam which, at a depth ranging from 30 to 36 inches, grades into reddish-brown gravelly sandy clay. The substratum is a medium heavy cobbly gravelly reddish-brown sandy material.

Stones and boulders are common on the surface and throughout the soil. They are a feature that must be considered in clearing land, and in places they are sufficiently numerous to prohibit profitable clearing and cultivation.

The areas of this soil are in general slightly more rolling than areas of Iron River silt loam, and the soil has freer drainage, but it cannot be considered droughty.

A small proportion of the aggregate acreage is under cultivation. Hay, oats, barley, and potatoes are the principal crops grown. Hay averages about 1⅓ tons an acre, oats about 45 bushels, barley 20 bushels, and potatoes about 135 bushels.

The virgin forest growth was similar to that on Iron River silt loam, with probably a higher percentage of hemlock and a few more large white pine scattered among the hardwoods. Areas which have been cut clean and burned-over areas reproduce largely to aspen (popple), together with spruce and some of the original species.

Hiawatha fine sandy loam.—Hiawatha fine sandy loam occurs chiefly on the rolling lands and knobby hills in the northwestern part of the county. It is distinguished by its loose pervious sandy surface soil and a pinkish-gray sandy loam subsoil.

Virgin areas of Hiawatha fine sandy loam have a 2- or 3-inch covering of forest mold overlying a lavender-gray loamy fine sand layer from 4 to 6 inches thick, which, in turn, is underlain by dark-brown or snuff-brown fine sandy loam grading downward into yellowish-brown fine sandy loam. Some cementation occurs in this layer which in most places ranges from 12 to 15 inches in thickness. Beneath this layer is a 4- to 10-inch layer of salmon-red sandy loam which merges with a friable sand-clay mixture consisting largely of sandy loam containing pockets of sand, sandy clay, or silty clay, having, in general, a pinkish-brown color. The heavier pockets of silty clay have a distinct reddish-brown color. The plowed soil, to a depth of 6 or 8 inches, is brownish-gray fine or medium-fine sandy loam.

Throughout most of the areas occupied by this soil stones are scattered over the surface or are present at a slight depth. There are more light-colored granitoid rocks on this soil than on the Iron River soils.

The soil is generally acid to a depth of several feet, but here and there is a spot, especially in the clay pockets, which is neutral or alkaline.

The rolling surface relief and pervious character of the soil afford good surface and subsurface drainage.

The forest growth is dominantly hardwoods. Small areas in the steeper and better drained situations, as near lake borders, are in white pine. The hardwood species are chiefly hard maple, yellow birch, and hemlock, with some elm and basswood and a few scattered spruce and balsam. Cut-over areas reproduce largely to hard maple and other species of the original growth. Severely logged-over and burned-over areas support a second growth of quaking aspen and fire cherry, together with some largetooth aspen and white birch and a ground cover of bracken.

Hiawatha fine sandy loam is not considered an agricultural soil, and a large proportion of it is in a national forest purchase unit. The total area of cropped land has never exceeded 100 acres, some of which has since been abandoned. Hay, oats, potatoes, and apples are grown. The returns from hay and oats are not so great as those obtained on the Iron River soils.

Munising loam.—Munising loam occurs in the same section as Hiawatha fine sandy loam. It comprises the more gently rolling areas and is mapped in the area transitional from Hiawatha fine sandy loam to the Baraga and Iron River soils.

The profile of the virgin soil consists of the following layers: (1) A 2- or 3-inch layer of litter and forest mold; (2) a 4- to 6-inch layer of lavender-gray very fine sandy loam; (3) a 3- or 4-inch layer of dark-brown or rust-brown loam which grades into a layer of brownish-yellow loam or silty loam, from 8 to 12 inches thick; (4) a compact or cemented salmon-colored sandy loam layer, from 8 to 10 inches thick; and (5) pinkish-gray sandy loam containing pockets of clay, sand, and silty material. The subsoil is variable in both color and texture and has a high clay content in places where the color is red. In other places the subsoil is compact gray sandy loam. There are more stones on the surface of this soil than on Hiawatha fine sandy loam.

Drainage is not quite so free as in the Hiawatha soil, as the substratum is more compact. Small wet spots are not uncommon. All this soil is in forest or cut-over land. Hard maple, yellow birch, hemlock, basswood, elm, and ash, together with white pine, fir, balsam, and spruce comprise the native vegetation.

Baraga loam.—Baraga loam occupies nearly level or gently rolling areas in the north-central part of the county. Under forested conditions this soil has a 2- or 3-inch layer of leaf litter, mold, and humus over a thin layer of dull-gray silty loam, which is underlain by a 15- to 18-inch layer of brownish-yellow mellow friable loam. The color of the material in the upper 2 or 3 inches of this layer is dark brown. This layer grades into pale yellowish-brown and

gray stony loam or sandy loam, which extends to a depth ranging from 30 to 36 inches where it grades into the substratum of slate-gray compact coarse till or pulverized rock.

Numerous small poorly drained areas and depressions, caused by the compact character of the subsoil, which tends to retard drainage, are characteristic surface features. Dark-colored rocks and rock fragments are present on the surface and throughout the profile. The land in general is excessively stony, but in some small areas the stones are scattered.

This is a comparatively fertile soil, as evidenced by the thrifty tree growth, but, owing to its stoniness and slow drainage, none of it is under cultivation.

Baraga loam supports a forest consisting chiefly of hardwoods, much of which is still standing. The trees are dominantly hard maple, yellow birch, basswood, hemlock, ash, elm, fir, balsam, and spruce, with scattered white pine. There are more hemlock, ash, elm, fir, balsam, and spruce in the virgin timber on this soil than in the timber on the Iron River or Hiawatha soils. On most of the cut-over areas, enough small trees have been left to reproduce the original species. Severely cut-over and burned-over areas support a second growth of aspen, together with maple, elm, fir, and spruce.

Trenary loam.—The profile of Trenary loam is similar to that of Iron River loam, but it differs in that the soil is alkaline in reaction in the substratum and limestone cobbles and boulders are scattered through the profile and on the surface. The virgin soil has a 2- or 3-inch cover of leaf litter, mold, and humus, overlying a shallow gray layer of very fine sandy loam. This is underlain by a 15- to 18-inch layer of cinnamon-brown loam or fine sandy loam, which grades through pale-gray sandy loam into the reddish-brown sandy clay, cobbly, bouldery substratum that becomes more sandy and gravelly with depth. The plowed surface soil, to a depth of 6 to 8 inches, is grayish-brown light loam.

The undulating or gently rolling relief affords sufficient surface drainage. The clayey substratum, although not impervious, tends to retard downward movement of water enough to render drainage conditions favorable for crops.

This soil is farmed to some extent but not to so great an extent as in the adjoining county—Dickinson. Hay, oats, barley, potatoes, and some corn for silage are grown. Crop yields compare favorably with those on Iron River loam.

The native forest cover is the association of hardwoods common to this section. Natural reproduction is dominantly hard maple, with some of the other original species. Second growth on burned-over areas is largely aspen, and there is some white birch, cherry, and willow.

Negaunee silt loam.—The undisturbed, or virgin, areas of Negaunee silt loam consist of a 2- or 3-inch layer of leaf litter, mold, and humus, underlain by a 3- or 4-inch layer of lavender-gray loam or silt loam, and this, in turn, by a 4- to 6-inch layer of buff-colored silt loam which grades into reddish-colored silty loam containing enough rock fragments to appear gravelly. This layer ranges from 15 to 18 inches in thickness. The substratum, which has a decidedly red color, consists of silty clay soil material between

fragments of shattered bedrock or hematite schist. In places solid bedrock lies from 2 to 4 feet below the surface, but in most places it is at a greater depth.

This is an inextensive soil occurring in small areas. The native timber growth, drainage, and the crops grown are the same as those on the Iron River soils.

SOILS HAVING COARSE SANDY, GRAVELLY, AND COBBLY SUBSOILS

The soils of this group in general are characterized by the loose, open, cobbly, gravelly character of the subsoil, good surface drainage, and a native forest cover of mixed pines and hardwoods. The group may be subdivided into three divisions as follows: (1) Soils occupying level benches and plains, (2) soils occurring as gently rolling or hilly land, and (3) rough ridges and rock outcrops. The soils of the level plains are Stambaugh silt loam, Stambaugh loam, and Kalkaska sandy loam. The soil with rolling or hilly relief is Amasa very fine sandy loam. The stony ridges and rock outcrop soils are Emmert stony sandy loam and rough stony land.

Stambaugh silt loam.—Stambaugh silt loam occupies smooth or level valley floors and stream benches in the southern part of the county.

The plowed surface soil, to a depth of 6 or 8 inches, is mellow friable grayish-brown silt loam which works readily and forms a good seedbed. It is underlain by a layer of silt over crudely stratified cobbles, coarse sand, and gravel, which extends to a depth ranging from 2 to 3 feet. The virgin profile has a thin covering of forest litter, mold, and humus over a 4- to 6-inch layer of light-gray silt loam. This is underlain by an 8- to 12-inch layer of buff-colored mellow friable silt which grades through a thin reddish-brown compact layer of silt and clay into the substratum of loose open coarse sand, gravel, and cobbles (pl. 2, *A*).

The level surface relief, the freedom from stones and boulders, the natural high productivity, and ease of cultivation render this soil desirable for agricultural purposes. Although the total area comprises only a small proportion of the entire area of the county, it is estimated that more than 50 percent of the land is under cultivation.

Although the subsoil furnishes free drainage, the surface soil, because of its fineness, has a tendency to retain moisture, making an almost ideal drainage condition.

Hay (timothy and clover), oats, barley, potatoes, and sunflowers are the crops grown on this soil. Crop yields compare favorably with yields of the same crops on Iron River silt loam.

The original forest cover was largely white pine, together with some hard maple, yellow birch, elm, ash, fir, and spruce. The hardwoods dominate over pine in a few local areas. The second growth is largely aspen, with a few white pine (pl. 1, *B*) and Norway pine. Immediately south of Hagerman Lake the second growth is poplar, with a large percentage of fir and spruce.

Stambaugh loam.—Stambaugh loam differs from Stambaugh silt loam in the lighter and coarser texture of the surface soil and the slighter thickness of the surface soil over the cobbly, gravelly subsoil. The texture of the surface soil is variable, ranging from fine

sandy loam to slightly gravelly silt loam, but most of the surface soil is loam. The upper layers of the virgin profile consist of a 1- or 2-inch layer of forest litter, mold, and humus overlying a thin gray silt loam layer which, in turn, is underlain by a 2- or 3-inch layer of cinnamon-colored or dark-brown loam. This material grades through lighter brown or buff-colored fine sandy loam or silty loam to the coarse sandy gravelly cobbly subsoil which lies at a depth ranging from 18 to 24 inches below the surface.

Stambaugh loam is farmed to some extent, and the same general crops are grown as those produced on the silt loam. Hay does not produce so great a tonnage as on the silt loam, but yields of grain and potatoes compare favorably.

Drainage conditions are more free, and during periods of drought crops are more likely to suffer from lack of moisture on the loam than on the silt loam.

White pine and some Norway pine were the dominant species in the original forest growth. The present growth is mainly aspen, with some white pine and Norway pine. Severely burned-over areas support clumps of jack pine, with some aspen and a ground cover of sweetfern and bracken.

Kalkaska sandy loam.—The total area of Kalkaska sandy loam is 768 acres. This soil occupies part of a flat near the east county line, known as the Mansfield settlement. The soil profile is similar to that of the Stambaugh soils, but the soil material differs from those soils in the alkaline reaction of the subsoil.

To a depth of 6 or 8 inches, the cultivated soil is grayish-brown sandy loam or fine sandy loam, which breaks into fine grains with little tendency to crust. This is underlain by light yellowish-brown loam which continues to a depth ranging from 18 to 20 inches. This material grades into a loose open sandy, gravelly, and cobbly substratum. Limestone cobbles are present in the gravelly subsoil and scattered over the surface. The clayey layer, or upper part of the substratum, is alkaline in reaction.

Kalkaska sandy loam is practically all under cultivation. Hay (timothy and clover), a little alfalfa, barley, oats, and potatoes are the crops grown.

The original forest cover was hard maple, yellow birch, elm, hemlock, and some white pine, fir, and spruce. The second growth is aspen, associated with some willow and scattered maple and elm.

Amasa very fine sandy loam.—The profile of virgin Amasa very fine sandy loam shows a thin covering of leaf litter, mold, and humus over a 2- or 3-inch layer of light-gray very fine sandy loam which rests on a layer of rust-brown very fine sandy loam 3 or 4 inches thick. This material grades into yellow very fine sandy loam or silty loam. At a depth ranging from 20 to 24 inches a compact brownish-gray sandy loam layer is reached, which grades into the brownish-gray loose cobbly gravelly bouldery substratum at a depth ranging from 30 to 36 inches. Light-colored stones and boulders are general on the surface and throughout the profile, and some areas are excessively stony.

In most places the surface relief ranges from rolling to hilly, but local areas are gently rolling or nearly level. The texture of the surface soil is variable. Level flat areas on the crests of hills are

very fine textured or silty in places. On the slopes and in basins between hills the texture is coarse, and a light sandy loam is not uncommon. Moisture is retained to some extent by the fine-textured surface soil. Subsurface drainage ranges from open to free.

The original forest cover was dominantly white pine, with some Norway pine and clumps of hardwoods. The present cover is poplar, with some young white pine, Norway pine, and scattered hardwoods. Open spaces are covered by a thrifty growth of bracken and coarse grasses.

Very little of this soil is under cultivation. The more level areas are the only ones cropped. Hay, oats, barley, and sunflowers are grown, and yields are about the average for the county.

Emmert stony sandy loam.—Emmert stony sandy loam comprises narrow winding ridges, knobs, or rough knolls. The general profile shows a thin layer of leaf litter, mold, and humous soil overlying a 2- or 3-inch layer of gray sandy loam. This material rests on light-brown gravelly stony sandy loam or loam, which becomes more stony and bouldery with depth. The soil is extremely stony and bouldery on the surface and throughout the profile, and in places boulders are predominant, with light-brown or gray sandy loam filling the interstitial spaces.

The original forest cover was Norway pine and white pine, together with a few hardwoods, and the present growth consists of aspen, white birch, red maple, and fire cherry, with a few Norway pine and scattered hardwoods.

Practically all this land is nonarable on account of its bouldery and hilly character.

Rough stony land.—From 40 to 70 percent of the area of rough stony land consists of bare rock (pl. 2, *B*). Soil ranging from a few inches to several feet in thickness occupies the hollows and depressions. In places where the soil is less than 2 feet thick a profile has developed to only a slight extent, but where it is thicker a profile similar to that developed in the correspondingly textured soils common to the county is in evidence.

These areas of rough land range from hilly to boldly hilly, with steep slopes and escarpments, and they generally occur close to stream valleys, especially those along Michigamme River east of Crystal Falls.

The original cover was a hardwood and white pine mixture, and the white pine predominated in the more sandy areas. The present cover is a rather sparse growth of aspen and white birch, with some reproduction of the original species.

Areas of rough stony land are unsuitable for agriculture.

SANDY SOILS

The soils of this group are characterized by the sandiness of the substratum, free to excessive drainage, and a forest cover which originally was dominantly pine. These soils are separated into two divisions based on surface relief—(1) soils of the level sandy pine plains and (2) soils of the sandy pine hills. Rubicon fine sandy loam, Rubicon sand, Omega loamy sand, and Randville fine sandy loam are the plains soils, and Vilas sand and Vilas loamy sand are the soils of the sandy pine hills.

Rubicon fine sandy loam.—Rubicon fine sandy loam occupies level plains and high-lying benches along Paint River, northwest and southeast of Crystal Falls. The profile differs from that of Stambaugh loam in that the surface soil is lighter textured and the subsoil is less gravelly or more sandy.

A profile of the virgin soil shows a thin covering of leaf litter, mold, and humous soil over a 3- or 4-inch layer of gray fine sandy loam which rests on a shallow layer of cinnamon-brown fine sandy loam. The material in this layer grades through buff-colored or pale-yellow fine sandy loam into the loose, open, porous salmon-colored sand substratum which lies at a depth ranging from 20 to 30 inches. In places immediately above the sand substratum is a thin reddish-brown compact sandy loam layer. Local spots of gravel occur both in the subsoil and in the surface soil.

The relief in general is smooth or level, but in places it is cut by potholelike depressions and drainage ways. The sandy character of the surface soil and substratum affords good or free natural drainage.

The original forest was white pine and Norway pine. The present growth consists of scattered young Norway pine, aspen, clumps of red maple, and open areas of bracken, a thrifty growth of sweetfern, and bluegrass.

Very little of the land is under cultivation. In natural productivity and moisture-holding capacity this soil occupies a place between Stambaugh loam and Rubicon sand.

Rubicon sand.—Rubicon sand is intermediate in characteristics between Rubicon fine sandy loam and Omega loamy sand. It is comprised of sand or loamy sand over a sand substratum. The virgin soil has a thin layer of forest litter, mold, and humous soil overlying a 2- or 3-inch layer of gray light sand or gray fine sand. This rests on a layer of brownish-yellow loamy sand which grades through yellow sand into salmon-colored medium sand or fine sand at a depth ranging from 20 to 24 inches. This soil is in general free of gravel, although small gravelly areas are not uncommon.

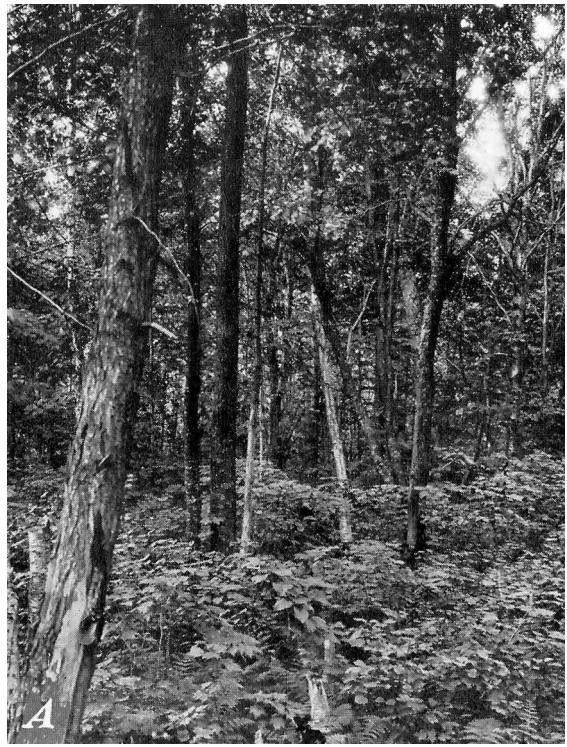
The surface relief is smooth or level, with potholelike depressions and glacial drainageways interrupting the continuity of the level areas.

The original forest cover was Norway pine and white pine, and the second growth is composed of aspen, with clumps of young Norway pine and scattered white pine. Sweetfern, bracken, and coarse grasses grow in the open spaces.

This soil is slightly better than Omega loamy sand in natural productivity and drainage, but it is not a good agricultural soil. Some of the land has been cultivated, but crop yields have not been encouraging. Consequently little of the soil is now under cultivation.

Omega loamy sand.—Omega loamy sand ranks lowest in natural productivity and has the freest drainage of the soils of this group. A burned-over area shows the following profile: A thin layer of leaf litter, over a 2- or 3-inch layer of grayish-brown loamy sand underlain by yellow sand which grades at a depth of 18 or 20 inches into the salmon-colored, loose, open, and porous sand or loamy sand substratum.

The absence of the light-gray layer and of the distinct brown layer above the yellow sand distinguishes this soil from the Rubicon soils.



A, Hardwood forest showing characteristic undergrowth. *B*, Second-growth white pine on Stambaugh silt loam.

A, Profile of Stambaugh silt loam, showing characteristic gravelly substratum. *B*. Rock outcrop dominant on rough stony land.

This soil comprises part of an area known as the Panola plains southeast of Crystal Falls.

Slow-growing Norway pine and a few white pine formed the original forest cover. The present growth, which followed severe fires, is composed of clumps of jack pines, together with a few scattered Norway pines of the original growth and aspen. The open spaces have a ground cover of sweetfern, coarse grasses, and mosses.

The droughty character and low natural productivity of this soil do not offer much encouragement for using the land for agricultural purposes, and no farming is carried on.

Randville fine sandy loam.—Randville fine sandy loam is similar to Rubicon fine sandy loam in surface characteristics, but it differs from that soil in that it is underlain at a depth ranging from 4 to 6 feet by layers of sand and silt or by a sandy clay substratum. The cultivated surface soil is dull grayish-brown light fine sandy loam. The more compact subsoil tends to retard drainage, and the soil as a whole is not so droughty as Rubicon fine sandy loam.

The original forest cover was white pine and Norway pine, in association with hard maple, yellow birch, and a few spruce. The present cover consists of aspen, with a variable amount of white pine, Norway pine, jack pine, and scattered hardwoods.

Only a small proportion of this land is under cultivation. Hay, oats, and potatoes are the main crops. Hay produces from one-half to three-fourths of a ton an acre, oats 20 to 30 bushels, and potatoes an average of about 90 bushels.

Vilas sand.—Vilas sand comprises the rough sandy country north of Kidney Lake in the northwestern part of the county. A profile of the virgin soil shows the following layers: (1) A thin layer of virgin forest mold, ranging from a mere film to 2 inches in thickness, (2) a 4 to 6-inch layer of lavender-gray harsh sand, (3) a 3- or 4-inch layer of brown loamy sand which is slightly cemented in places, (4) a 15- to 18-inch layer of brownish-yellow or yellow sand, and (5) the substratum of salmon-colored loamy sand.

Vilas sand has a hill-and-basin type of relief. Some of the basins are occupied by swamps and others by dry sandy soil. The hills are comprised largely of a covering of sandy soil over rock, and very small areas of rock outcrop are present. In general, the texture of the surface soil is loamy sand, but in some of the more level areas, in which rock lies within 4 feet of the surface, it is sandy loam. Small bodies of this soil are closely associated with Hiawatha fine sandy loam.

The original forest was dominantly Norway pine, with some white pine, and the present cover consists of aspen, clumps of jack pine, young Norway pine, upland willow, and scattered Norway pine of the original growth. The open spaces are covered with sweetfern, bracken, and coarse grasses.

Because of its rough and choppy character, low natural productivity, and droughtiness, this soil is not suited for agriculture.

Vilas loamy sand.—Vilas loamy sand occurs on the Norway pine and oak hills south of Crystal Falls. The soil in the virgin state has the following layers: (1) A thin layer of leaf litter, mold, and humus; (2) a 3- or 4-inch layer of gray loamy sand; (3) a 15- to 20-inch layer of cinnamon-yellow loamy fine sand or sandy loam;

(4) a 16- to 24-inch layer of reddish-yellow or pale salmon-colored loamy sand; and (5) a substratum of salmon-colored sandy loam containing pockets of reddish-yellow sandy clay.

Vilas loamy sand differs from Hiawatha fine sandy loam in the more distinct yellow color of the surface soil and more pervious character of the substratum.

A small aggregate acreage is occupied by this soil. Most of the land is rolling and consists of low hills and ridges with smooth and not excessively steep slopes. Small level areas occur here and there.

The original forest growth was dominantly Norway pine, oak, and white pine. The present growth consists of a sparse stand of poplar, red maple, oak, upland willow, Norway pine, and white pine, together with an undergrowth of bracken, sweetfern, and briers.

This soil, though slightly higher in natural productivity and not so droughty as Rubicon sand or Vilas sand, is not used for the production of crops.

SOILS OF THE STREAM BOTTOMS

This group includes soils which occur in stream bottoms. The materials are alluvial, and the lands are subject to overflow at least once a year, generally more frequently. These soils are consistently wet in the subsurface layers but have fair or good surface drainage between periods of overflow. The original forest growth was largely elm and ash, with variable quantities of balm-of-Gilead poplar, cedar, and spruce. The overflow channels and ox bows support a growth of alder and willow, with the open spaces occupied by grass.

These soils occur in narrow strips or small areas and are seldom cultivated, but they are used to some extent for pasture.

Brule loam.—The surface soil of Brule loam is dark-brown or reddish-brown loam or heavy sandy loam overlying alluvial material consisting of sandy, silty, and gravelly layers of variable thicknesses, which are usually wet or saturated.

Brule loam, gray phase.—The gray phase of Brule loam differs from Brule loam in the color of the surface soil which is gray loam or silty loam. This layer is underlain by sandy and silty layers of alluvial material.

Kerston muck.—Kerston muck has a dark surface soil consisting of mucky silt or sand, ranging from several inches to a foot or more in thickness, overlying layers of sandy, silty, and mucky alluvial material. The surface soil is not quite so well drained as Brule loam, and the forest cover contains a higher proportion of conifers.

POORLY DRAINED OR MARSH-BORDER SOILS

The mineral soils developed under poor drainage are included in this group. The group may be subdivided into (1) soils with semi-poor or imperfect drainage and (2) soils with distinctly poor or deficient drainage. The imperfectly drained soils occupy foot slopes, flats, and strips bordering swamps which have some natural drainage. Channing fine sandy loam and Gaastra silt loam are included in this subdivision. The soils with poor or deficient drainage occupy flat wet borders of swamps and marshes, low flats, and depressions

with insufficient natural drainage. Adolph loam, Adolph silt loam, and Diana stony loam are the soils of this subdivision.

The soils with imperfect drainage have light-colored surface soils, and the forest cover is dominantly upland hardwood species, whereas the soils with deficient drainage have dark-colored or mucky surface soils, and the cover is characteristic of swamp lands—chiefly swamp hardwoods and conifers.

Channing fine sandy loam.—The profile of Channing fine sandy loam shows the following layers: (1) A dark-colored layer of mixed peaty organic matter and fine sand, ranging from 3 to 6 inches in thickness; (2) a 4- to 8-inch layer of gray sand or fine sand; (3) an 8- to 12-inch layer of rust-brown or coffee-colored fine sandy loam which is cemented in places; (4) a 6- to 12-inch layer of gray and yellow fine sandy material which is moist or saturated; and (5) somewhat red or salmon-colored compact sandy clay material. This soil occupies poorly drained areas of the upland fine sandy loam or loam mineral soils on foot slopes, moist flats, and swamp borders, where the uplands grade into the swamp. In places the surface relief has a hummocky appearance caused by the occurrence of small hummocks of dry soil and depressions of wet or swampy soil. The gently sloping foot slopes receive seepage from the bordering upland.

Most of this soil is flat and semipoorly drained. The original forest growth was fir, spruce, and swamp maple, in the wetter places, with hemlock, white pine, elm, and yellow birch on the drier parts. The present growth consists mainly of poplar and white birch, with some reproduction of the original species.

Included with Channing fine sandy loam are areas which differ from the typical soil in the more sandy texture of the surface soil and of the subsurface soil which consists of sand or light sandy loam to a depth of more than 4 feet. The brown layer is more conspicuous, and there is a greater amount of cementation.

The original forest cover of these areas was dominantly white pine. Norway pine grew on some of the drier sandy spots and spruce and fir on the wetter spots. The present growth is aspen, spruce, fir, alder, and white birch in the wetter spots, and some fire cherry, poplar, and Norway pine on the drier land. Bracken, blueberries, and wintergreen are characteristic of the undergrowth.

Channing fine sandy loam is cultivated in those places where small bodies are closely associated with the well-drained upland soils. The soil seems to be fertile and, when moisture conditions are favorable, produces as well as the dominant surrounding upland soil. The plowed surface soil has a more or less spotted appearance caused by light-colored and dark-colored spots where the land is hummocky. Level areas have a grayish-brown or spotted gray and brown fine sandy loam surface soil.

Gaastra silt loam.—Gaastra silt loam occupies narrow valleys, swales, and depressions in the section where the silty soils occur, and it is associated with Iron River silt loam.

The plowed surface soil, to a depth of 6 or 8 inches, is dark-gray silt loam. This is underlain by silt to a depth ranging from 3 to more than 4 feet.

The profile of the virgin soil consists of the following layers: (1) Dark-gray silt loam high in organic matter, 2 or 3 inches thick;

(2) ash-gray silt loam, from 5 to 7 inches thick; (3) yellow or rust-colored silt loam mottled with gray, 8 or 10 inches thick; (4) gray silt loam with yellow and rust-colored mottlings, 12 to 15 inches thick; (5) salmon-colored or somewhat red compact silt loam; and (6) the parent material, a reddish compact silt and clay mixture which lies at a depth ranging from 40 to 50 inches.

This soil occupies level or gently sloping areas which have fair surface drainage during most of the year but on which water remains after heavy rains. The subsurface soil is moist or saturated most of the time. Stones and boulders are common on the surface, in some places excessive, but the subsurface soil is practically stone free to a depth ranging from 4 to 5 feet.

The only cultivated areas are small bodies which lie adjacent to or are surrounded by areas of well-drained upland soil. The soil seems to be fertile, and yields compare favorably with yields obtained on Iron River silt loam.

The forest growth is comprised of hard maple, yellow birch, ash, elm, hemlock, balsam fir, and spruce, and there are many large white pine stumps in the forests. Ash, elm, hemlock, balsam fir, and spruce are more numerous on this soil than on Iron River silt loam. Cut-over areas support a thrifty growth of aspen, together with considerable balsam fir and spruce.

Adolph loam.—The surface soil of Adolph loam consists of dark-gray or nearly black sandy loam or fine sandy loam. The dark color is due to organic matter which accumulated under wet conditions. This layer is underlain by gray fine sandy loam which becomes mottled yellow and brown with depth and grades into heavy sandy loam or reddish-brown sandy clay. The dark-colored layer ranges from 3 to 16 inches in thickness.

This soil occurs on flat wet borders of swamps and in flat poorly drained depressions and valleys within areas of the well-drained upland sandy loam soils. Small bodies of muck and Channing fine sandy loam are included in mapping. Stones and boulders occur on the surface and through the soil.

The original forest growth was mainly ash, elm, and white birch, together with cedar, spruce, and fir. The conifers were dominant in the wetter places. The second growth is composed of aspen, alder, cedar, spruce, and fir, with some white birch, ash, and elm in places.

Included with Adolph loam are areas of sandy soils which occur on poorly drained sand plains and on wet flat borders of swamps and marshes. The soil in such areas consists of a layer of dark-gray or nearly black sand and loamy sand underlain by grayish-white or dingy-white wet sand which, in turn, is underlain by gray and yellow mottled sand or light sandy loam.

The greater part of Adolph loam is too wet and stony to be of any agricultural value. A few acres are utilized for pasture and hay land, but artificial drainage is necessary before the land can be used for any other purpose.

Adolph silt loam.—Adolph silt loam has a dark-gray silt loam surface layer underlain by lead-gray wet silt which, with depth, becomes mottled with rust brown and yellow and is more compact. The dark-colored surface layer is mucky in places and ranges from 4 to 12 inches in thickness.

Adolph silt loam occupies low flat areas bordering swamps and flat depressions in the upland, and their combined acreage is small.

This soil is not used for agriculture, as artificial drainage is necessary before it can be cultivated. The natural forest cover is mainly elm and ash, together with cedar, spruce, fir, and some hemlock and yellow birch.

Diana stony loam.—The topmost layer of Diana stony loam consists of rocks and boulders, with the spaces between the stones filled with black mucky soil or organic material. This is underlain by gray or gray, yellow, and brown mottled wet loam or silty loam. The stony layer ranges from 15 to 24 inches in thickness.

This soil occupies low flats and areas bordering swamps in the northern part of the county, mainly in association with Baraga loam.

The original forest cover was dominantly cedar, spruce, and tamarack, with some white birch, elm, and ash. The second growth is largely alder, with poplar and a reproduction of the original species. The stony, bouldery character and poor drainage of this soil render it unfit for agriculture.

MUCK AND PEAT SOILS

This group of soils includes the organic soils which are composed mainly of plant remains in various stages of decomposition. In permanently wet situations, such as flat valley floors, swales, slopes permanently wet from seepage, and certain kinds of lakes, there have gradually accumulated deposits of partly decomposed plant matter which is the residue of generations of vegetation that has grown in these situations. The deposits which have accumulated under the poorest drainage are the least decayed, whereas those accumulated under better drainage are more completely decayed. The organic soils occur as swamps, heath bogs, and marshes in this county. They occupy 18.5 percent of the total area, and they have little or no agricultural value. Posts, ties, and pulpwood are cut from the forests which grow in the swamps.

Carbondale muck.—Carbondale muck occurs on foot slopes and slightly sloping valley floors or in swamps which have fair or good natural drainage. It consists of dark-brown or black fairly well decomposed woody peat which grades into brown woody peat. The water table lies at a depth ranging from 20 to 30 inches from the surface during most of the summer. This soil ranges from neutral to acid in reaction. The native vegetation consists of a dense thrifty growth of cedar, together with soft maple, yellow birch, white birch, spruce, tamarack, and some elm and ash. Areas which have been logged off and burned over support a dense growth of alder, aspen, and willow, with some white birch. Posts, poles, and pulpwood are the most valuable products, as this land is unused for agriculture.

Spalding peat.—Spalding peat occupies poorly drained swamps covered with a spruce-tamarack forest. It consists of brown coarse moderately well decayed woody peat underlain at a depth ranging from 20 to 30 inches by raw fibrous peat showing very little sign of decomposition. The water table lies at a depth of more than 2 feet during the summer. This peat is acid in reaction. Sphagnum moss, leatherleaf, and Labrador-tea constitute the ground cover

under the spruce and tamarack. Pulpwood is the most valuable product obtained from the tree growth on this type of peat.

Greenwood peat.—Greenwood peat occurs in open heath bogs and wet marshes. It consists of yellowish-brown raw coarse fibrous peat, in which the plant material has decayed but slightly, even at the surface. The water table is at or near the surface during the spring and wet seasons, but during dry periods it may range from 2 to 3 feet below the surface. Some of the Greenwood peat has a watery subsurface soil and is semifloating, and open spots of water are not uncommon in the bogs. The heath bogs support a growth of leatherleaf, Labrador-tea, sphagnum moss, and some cranberries and coarse grasses.

Dawson peat.—Dawson peat consists of a layer of yellowish-brown raw coarse fibrous peat containing roots of the present tree growth, which have decayed but slightly, overlying black fine pasty muck at a depth ranging from 2 to 3 feet. The water table lies at the same depth as in Greenwood peat. The native vegetation consists of stunted spruce and tamarack, together with a ground cover of leatherleaf, Labrador-tea, and sphagnum moss.

Houghton muck.—Houghton muck occurs in small areas along streams as old beaver meadows or bluejoint meadows. It occupies the drier better drained marshes. It consist of dark-brown moderately well decayed fibrous peat or muck to a depth ranging from 2 to 3 feet. The material in the topmost few inches is not so well decayed as that below. Under natural conditions the water table lies from 1 to 2 feet from the surface. The native vegetation consists of fine sedges and bluejoint, together with clumps of willow and alder.

This muck soil is not used for cultivated crops, but some of the native grasses are cut for hay.

Tahquamenon peat.—Tahquamenon peat occurs in sedge-wiregrass marshes which have a persistently high water table. This peat consists of a raw tough fibrous sedge mat over dark fine pasty smeary muck. The marshes are usually flooded with water in the spring and during rainy seasons. The water table is seldom very far below the surface. This peat has no present agricultural value.

MISCELLANEOUS LAND TYPES

Made land.—Made land includes areas in which the surface materials have been hauled in, generally for the purpose of raising the level of the land for industrial or other uses. Such areas have no direct agricultural value.

Mine pits.—Mine pits include the pits and adjacent dumps, resulting from the mining of iron ore. Although their total area is small, these pits are conspicuous features of the terrain where they occur. The stony character of the material exposed and the rough surface of the pits and dumps render them unfit for agricultural use.

SOILS AND THEIR INTERPRETATION

The soils of Iron County have been described in detail in a preceding section of this report. The following pages give a brief discussion of their origin, taxonomy, and evolution.

This county lies within parallels of latitude 46° and 47° N. and of longitude 88° and 89° W., in the section known as the Great Lakes soil region. The average annual precipitation is 33.72 inches, which includes a rather heavy annual snowfall. An average annual temperature of 39.2° F., low evaporation, and comparatively low wind movement are characteristic of the region. The soils belong to the group of Podzol soils.[6]

The soils supported dense forests of northern hardwoods, such as hard maple (*Acer saccharum*), yellow birch (*Betula lutea*), basswood (*Tilia americana*), elm (*Ulmus americana*), ash (*Fraxinus Americana*), and such coniferous species as pines, spruce, and fir, or mixed hardwoods and conifers. Large areas of the original hardwood forests are still standing.

The land features are formed by a comparatively thin covering of glacial drift over preglacial formations of rock, resulting in till plains, moraines, sand and gravel plains of glacial and aqueoglacial origin, with preglacial formations appearing as rock outcrops. The parent material of the soils is glacial drift deposited during two substages of the Wisconsin glacial age and is largely loose-textured very stony material.[7] The older substage deposited a red drift containing rock material from such formations as the upper Huronian slate, iron ores, and associated rocks which are dark brown or reddish brown in color, and many of them are basic. The later substage deposited a gray drift containing more quartzitic and acidic or light-colored rocks. The color of this drift was influenced by Lake Superior sandstone and rocks of iron-bearing formations. Over a large part of the county the two drifts are intermixed to such a degree that differentiation is difficult. The reddish-brown drift is more distinct in the southwestern part.

Soil-forming processes have been active since the Wisconsin stage of glaciation, which, geologically, is a short time ago. The thickness of the normal soil profile, which is equivalent to the surface zone of soil development, averages about 4 feet and in places reaches a depth of 6 feet. This is an extraordinary thickness considering the geological age of the material and the low average temperatures, and it is accounted for by the loose open unconsolidated character of the glacial deposits and by the fact that these were more or less decomposed when the soil-forming processes began.

The generally fine texture of the surface soils is no doubt influenced by decomposition of the slates, schists, iron ores, and associated rocks. The finer textured or silty soils are generally associated with the parent material in which these rocks and rock fragments are apparent.

On the basis of their composition, two groups of soils are represented—mineral soils and organic soils. The mineral soils comprise about 81 percent of the county and the organic soils about 19 percent.

The mineral soils are represented by two major divisions: (1) The well-drained soils or soils containing a normal amount of moisture for the region, and (2) poorly drained soils or soils in which

[6] MARBUT, C. F. SOILS OF THE UNITED STATES. In Atlas of American Agriculture, pt. 3, Advance Sheets no. 8, illus. 1935.

[7] LEVERETT, F. MORAINES AND SHORE LINES OF THE LAKE SUPERIOR BASIN. U. S. Geol. Survey Prof. Paper 154: 1–72, illus. 1929.

water exists permanently or for considerable periods, to the extent of complete soil saturation or waterlogging.

The generalized profile for the virgin mature soil of Iron County consists of the following layers: (1) The horizon of organic accumulation, which is comparatively low in humus; (2) the light-gray horizon of maximum eluviation (removal of bases and colloids); (3) the brown horizon which receives its color from colloidal iron oxide and organic matter and is in part a result of deposition or concentration; (4) the horizon of maximum content of clay or inorganic colloids and maximum intensity of oxidation (iron oxide) color; (5) the horizon exhibiting evidence of slight alteration by surficial weathering agencies, but essentially parent material which may exhibit some evidence of deposition of carbonates; and (6) the unaltered geologic formation, or parent material.

The well-drained mineral soils exhibit three important variations of the generalized profile: (1) Soils having the well-developed profile of the county, which are underlain by a medium or heavy parent material; (2) soils underlain by coarse sandy gravelly cobbly material, in which the profile is moderately well developed; and (3) soils having a weakly developed profile, which are sandy throughout.

The soils of group 1 are Iron River silt loam, Iron River loam, Hiawatha fine sandy loam, Munising loam, Baraga loam, and Trenary loam.

The Iron River soils are underlain by medium heavy sandy bouldery reddish-brown till. The most mature profile for the county may be delineated by a description of a profile of a virgin area of Iron River silt loam in sec. 22, T. 43 N., R. 34 W.

1. A 3-inch layer of forest litter and humus.
2. A light lavender-gray floury silt loam layer, 4 inches thick.
3. An 18-inch layer of buff-colored mellow friable silt loam, the upper 3 inches of which is darker, or cinnamon brown.
4. A pale-yellow or salmon-colored silt loam layer, splotched with gray and rust brown, 12 inches thick.
5. A compact reddish-brown sand-clay mixture slightly mottled with brown and gray and containing rock fragments and chips of schist material, 12 inches thick.
6. Medium heavy sandy bouldery reddish-brown till showing some variegation in the upper part.

The parent material contains a high percentage of dark-colored basic rocks which are alkaline in reaction to Soiltex, and it becomes slightly lighter textured with depth.

The variation of this profile and the general profile of the soils of this group from the representative profile of the Podzol soils as a whole occurs in layer 4. This is a bleached layer which is lighter in color (pale yellow or gray) and in most places splotched with rust brown and generally lighter in texture than layer 3 or the brown-yellow horizon. This layer is present in soils which have a clayey layer or are underlain by comparatively impervious material. The position of this layer, occurring as it does over a more or less impervious layer, and the generally mottled condition would suggest that the material is the result of retarded drainage. The paler color and prevailingly coarse texture indicate a certain amount of leaching. The main difference between Iron River silt loam and Iron River loam is that the profile of the loam is less thick.

The Hiawatha soils have pinkish- or salmon-colored sandy loam parent material containing pockets of clay and fine sand or silt. The bleached horizon is represented by pale-gray sandy loam, and the compact clayey layer is only faintly developed or absent. The parent material is glacial till.

Baraga loam is underlain by compact coarse slightly cemented gray till or ground-up dark-colored rock material. Although the profile has developed distinct horizons, comparable to horizons in Iron River silt loam, the depth to which the soil-forming processes have been active is comparatively slight, in most places not more than 3 feet. This activity has been retarded by the compact character of the subsoil and the nearly level or gently rolling character of the surface relief, factors which produce slower drainage. In the more rolling areas, the upper part of the subsoil has developed a reddish cast.

Trenary loam has a profile similar to that of Iron River loam, but the sandy bouldery till contains some Hermansville limestone and more light-colored rocks. The upper part of the subsoil is alkaline.

The surface relief of the soils of this group ranges from nearly level to moderately hilly. The dominant forest growth consists of hardwoods. These soils have the deepest accumulations of surface material or plant refuse and in general contain the most organic matter in horizon B, or the horizon of deposition or concentration.

The soils of group 2 occur on the level benches or plains and rough valley fills locally associated with rough hilly country. The original forest cover was a mixture of pines and hardwoods, with pines dominant. The drainage in general ranges from free to good. Stambaugh silt loam, Stambaugh loam, Kalkaska sandy loam, Amasa very fine sandy loam, and Emmert stony sandy loam comprise the soils of the group.

A representative profile of the soils of this group is given in a description of the profile of a virgin area of Stambaugh silt loam, in the NE¼ sec. 22, T. 44 N., R. 33 W., showing the following layers:

1. A 2-inch layer of forest litter, mold, and humus.
2. A 6-inch layer of ash-gray silt loam.
3. A 16-inch layer of buff-colored silt loam.
4. A 20-inch layer of gray and yellow mottled compact silt loam.
5. A reddish-brown compact gravelly and cobbly silt and clay mixture, 8 inches thick.
6. Loose open roughly stratified coarse sand, gravel, and cobbles, containing a high percentage of dark-colored rock material.

This soil occurs on level plains or terrace benches. The main difference between Stambaugh silt loam and Iron River silt loam is the more loose sandy cobbly subsoil, the level surface relief, and, in general, the slighter development of the bleached layer and clayey layers.

In Stambaugh loam the underlying gravelly cobbly substratum is, in most places, within 20 inches of the surface, and the profile is not so definite in layers 4 and 5.

Kalkaska sandy loam occurs on a flat plain, and its profile is similar to that of Stambaugh silt loam, the main difference being in the alkaline character of the subsoil, horizon 5 and the upper part of the parent material containing limestone fragments.

Amasa very fine sandy loam has a rough surface relief, and the underlying material is only roughly stratified or unassorted stony gravelly material.

Emmert stony sandy loam occupies ridges, kames, and knoblike hills. In general this soil is very bouldery from the surface down.

In general the soils of this group have a somewhat thinner accumulation of organic matter on the surface, not so much organic matter in the B horizon, and the several layers of the profile do not show the extent of development as the soils of group 1.

The soils of group 3 consist of light sandy material throughout, and they have the least well developed profiles of the well-drained soils. They occur on level sandy plains and hilly morainic areas. White pine and Norway pine constituted the original forest cover. The present tree growth is largely aspen and reproductions of the original species which have sprung up following fires.

The soils of this group are Rubicon fine sandy loam, Rubicon sand, Omega loamy sand, Randville fine sandy loam, all of which have level or nearly level surface relief, and Vilas loamy sand and Vilas sand, which are hilly.

A profile fairly representative of soils of this group is that of Rubicon sand. The description of a profile of this soil in the SW¼ Sec. 25, T. 43 N., R. 32 W., is as follows:

1. A 1-inch layer of forest litter, mold, and humus.
2. A 6-inch layer of ash-gray sand.
3. A 6-inch layer of cinnamon-brown loamy fine sand.
4. A 10-inch layer of pale-yellow fine loamy sand.
5. The parent material of salmon-colored sand.

Rubicon fine sandy loam, in contrast to Rubicon sand, in places has a faint development of a clayey layer represented by a compact sandy loam, but in general the main difference is in the texture of the surface soil.

Omega loamy sand has a very weakly developed profile with a very thin light-gray layer or has a grayish-brown layer over the pale-yellow sand. The salmon-colored parent material lies at a slight depth, ranging from 15 to 20 inches below the surface.

Randville fine sandy loam is similar to Rubicon fine sandy loam, but it is underlain at a depth ranging from 5 to 6 feet by somewhat stratified layers of sand and silt or gravel and in places by till material.

A description of a profile of Vilas loamy sand examined in the NW¼ sec. 11, T. 41 N., R. 32 W., is as follows:

1. A 2-inch layer of grass and burned forest mold.
2. A 4-inch layer of gray harsh sand.
3. An 18-inch layer of cinnamon-yellow loamy fine sand.
4. Pale salmon-colored sandy loam.

Although the substratum is generally heavier in this soil, profile development is weak, owing to the sandiness and excessive drainage.

The profile of Vilas sand resembles that of Rubicon sand. The main difference between the two soils is the knoll-and-basin type of surface relief of the Vilas soil.

These soils are covered by a thin layer of forest litter, mold, and humus, and the layer of accumulation shows only slight coloration from organic matter. Layers 4 and 5 are represented by pale-yellow sand.

The mineral soils developed under deficient drainage or excessive moisture, have the following generalized profile:

1. A dark-colored mucky accumulation.
2. An ash-colored (gray) leached layer.
3. A coffee-brown, rust-colored, yellow, or mottled rust-colored, yellow, and gray horizon containing maximum yellow or brown coloration and cementation from iron oxides.
4. A bluish-gray or mottled drab and yellow horizon showing a maximum degree of coherence or plasticity.
5. The substratum, or parent material.

In such soils as Channing fine sandy loam or Gaastra silt loam, which are semipoorly, or only imperfectly, drained, horizon 3 is the most prominently developed, and the dark-colored mucky surface accumulation is shallow or absent. In the soils developed under moisture conditions to the extent of complete saturation or water-logging, horizons 3 and 4 are not distinctly separate but are represented by a blue-gray or gray color, mottled with rust brown or iron oxide, and a mucky surface layer ranging from 3 to 12 inches in thickness.

The youngest soils which have incompletely developed profiles are alluvial and occur in the first bottoms of streams. The alluvial soils, as they occur in this county, are subject to overflow, and new material is added or taken away each year. The alluvium is local in origin, and the color below the surface is influenced by the origin of the material. The average moisture content is high in most places, and swampy or semiswampy areas occur. Alternate layers of mineral material and muck are not uncommon in the deposits. Some of the muck may be transported, but for the most part it is accumulated in place. The organic soils ocur in permanently wet situations, such as flat valley floors and swales, slopes permanently wet from seepage water, and old lake beds which have been completely or nearly filled in with plant remains. The deposits on the whole are comparatively shallow, ranging in thickness from 1 foot to more than 10 feet. They are for the most part underlain by sand, clay, or bedrock. Very little evidence of marl is found.

These soils differ in such physical and chemical characteristics as composition of material, degree of alteration, and content of organic matter. More or less alteration, as represented by a blackish dark-brown color, and destruction of the botanical character of plant remains is generally associated with the better drained situations. The least altered and most acid type of organic soil, Greenwood peat, occurs in bogs or areas in which there is very little, if any, movement of water, although the height of the water table fluctuates to some extent at different periods of the year. In general, the better decomposed organic soils, having the best drainage conditions, tend toward an alkaline reaction, and the least decomposed soils, having the highest water table, are more acid.

The soils of this county occur in a gradational series, according to variations in the moisture or drainage conditions under which the particular soil has developed. Wide variations in short horizontal distances, intimate association of soil types, and great diversity of soil types are due, in part, to the lithologic heterogeneity of the parent material and in part to the variations in thickness of comparatively pervious material over bedrock or comparatively impervi-

ous clayey material, which results in a wide range of moisture conditions.

SUMMARY

Iron County is located in the western part of the Upper Peninsula of Michigan and is in the Menominee Iron Range belt. The total land area is 1,174 square miles.

The county in general is moderately hilly. Broadly rolling hills, depressions, and valleys, locally interrupted by sharply rising or knolly hills and areas of rock outcrop are characteristic. Elevations range from 1,200 to more than 1,800 feet above sea level.

There are comparatively few streams and about 200 lakes in the county.

The county was originally forested with northern hardwoods, conifers, or mixed hardwood and coniferous forests on the well-drained land. Swamp types of vegetation, as cedar, spruce, and tamarack, grow on the peat soils.

Transportation facilities are afforded by several railroads and paved or graveled highways.

The main features of the climate are long cold winters, short summers, an average precipitation of 33.72 inches, and an average frost-free season of about 90 days. Frosts may occur during any month of the year.

The county was organized in 1885. Permanent settlement began about 1880. Mining, lumbering, and agriculture are the main industries.

Only about 2½ percent of the total area of the county is cultivated. Agriculture consists of general farming and livestock raising or dairying. Only the more staple crops, such as hay, oats, barley, and potatoes, are grown.

Most of the soils are of fine texture. They are prevailingly stony on the surface and throughout the profile. The well-drained soils have developed under forest and belong with the group of Podzol soils. The virgin soils are characterized by a surface layer of organic matter only slightly decomposed or humified and a gray or ash-colored surface soil underlain by a brown-yellow layer. The soils are prevailingly acid and in general are of medium productivity.

The well-drained upland soils are divided into three groups characterized by the similarity of the parent material and forest cover, as follows:

(1) A group of soils with a medium or heavy substratum, on which the dominant forest cover is hardwoods. The soils of this group are Iron River silt loam, Iron River loam, Hiawatha fine sandy loam, Munising loam, Baraga loam, Trenary loam, and Negaunee silt loam.

(2) Soils with a coarse sandy, gravelly, and cobbly subsoil on which the forest cover was of a mixed hardwood-pine type. This group is represented by Stambaugh silt loam, Stambaugh loam, and Kalkaska sandy loam, which are level in surface relief, and Amasa very fine sandy loam which occurs in more rolling or hilly areas.

(3) Soils with a sandy subsoil on which the dominant forest cover was pine. These soils are generally sandy in the surface horizons and are represented by Rubicon fine sandy loam, Rubicon sand, Omega loamy sand, and Randville fine sandy loam, which occur on

generally level areas, and Vilas loamy sand and Vilas sand, which are hilly.

Emmert stony sandy loam and rough stony land are practically nonarable. The alluvial soils are grouped in the Brule and Kerston series. The organic soils are scattered over the county in small areas. They are not used for agriculture.

The soils best adapted for agriculture are the Iron River soils, the Stambaugh soils, Trenary loam, and Kalkaska sandy loam.

The great number of stumps and the generally stony character of the soils makes the clearing of new land laborious and expensive. These factors, combined with the short and uncertain growing season and distance to markets, do not offer much encouragement for agriculture as an income-producing industry.

A second growth of trees on cut-over land, virgin forests, and burned-over areas occupy about 96 percent of the total area of the county. Second-growth timber on cut-over lands, which have not been burned over, reproduces rapidly and has a thrifty growth.

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R.37W. R.36W. R.35W. R.34W. R.33W. R.32W. R.31W.

T.46N. T.45N. T.44N. T.43N. T.42N. T.41N.

L E G E N D

LETTER DESIGNATION & MAP SYMBOLS	R	Q	S	T	O	X	P	G	H
TOPOGRAPHY	GENTLY ROLLING UPLANDS	GENTLY ROLLING TO ROLLING UPLANDS	GENTLY ROLLING UPLANDS	ROLLING TO HILLY UPLANDS	ROLLING TO HILLY UPLANDS	KNOLLS AND PROMINENT HILLS	LEVEL PLAINS	LEVEL PLAINS	LEVEL
SOIL	SILT LOAM TO LOAM	FINE SANDY LOAM TO SILTY LOAM	VERY FINE SANDY LOAM TO LOAM STONY	SANDY LOAM TO LOAM	LOAMY SAND TO SANDY LOAM	ROCK OUTCROP	SILT LOAM TO LOAM	LOAMY SAND TO FINE SANDY LOAM	PEAT AND MUCK
AMOUNT OF AVAILABLE MOISTURE	INTERMEDIATE TO MODERATELY HIGH	INTERMEDIATE TO MODERATELY HIGH	INTERMEDIATE TO PERIODICALLY EXCESSIVE	INTERMEDIATE	LOW TO INTERMEDIATE	VARIABLE	LOW TO INTERMEDIATE	PREVAILINGLY LOW	GENERALLY EXCESSIVE
RELATIVE NATURAL FERTILITY	PREVAILINGLY HIGH	INTERMEDIATE TO MODERATELY HIGH	MODERATELY HIGH TO HIGH	INTERMEDIATE	LOW TO INTERMEDIATE	VARIABLE	INTERMEDIATE TO MODERATELY HIGH	PREVAILINGLY LOW	VARIABLE
VIRGIN FOREST GROWTH	HARDWOODS	HARDWOODS OR HARDWOODS & PINE	HARDWOODS	CHIEFLY HARDWOODS	PINE	PINE AND HARDWOODS	CHIEFLY PINE	PINE	CHIEFLY SWAMP CONIFERS PARTLY SEDGES SPHAGNUM LEATHER LEAF
LOCAL NAME	IRON RIVER HARDWOOD UPLANDS	AMASA HARDWOOD PINE UPLANDS	BARAGA HARDWOOD HIGHLANDS	WATERSMEET HARDWOOD UPLANDS	MASTODON PINE HILLS	CRYSTAL FALLS ROCK KNOBS	PENTOGA PINE PLAINS	PANOLA PINE PLAINS	SWAMPS, MARSHES AND BOGS

FIGURE 2.—Natural land divisions of Iron County, Mich.

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R.37W. R.36W. R.35W. R.34W. R.33W. R.32W. R.31W.

T.46N. T.45N. T.44N. T.43N. T.42N. T.41N.

L E G E N D

LETTER DESIGNATION & MAP SYMBOLS	R	Q	S	T	O	X	P	G	H
TOPOGRAPHY	GENTLY ROLLING UPLANDS	GENTLY ROLLING TO ROLLING UPLANDS	GENTLY ROLLING UPLANDS	ROLLING TO HILLY UPLANDS	ROLLING TO HILLY UPLANDS	KNOLLS AND PROMINENT HILLS	LEVEL PLAINS	LEVEL PLAINS	LEVEL
SOIL	SILT LOAM TO LOAM	FINE SANDY LOAM TO SILTY LOAM	VERY FINE SANDY LOAM TO LOAM STONY	SANDY LOAM TO LOAM	LOAMY SAND TO SANDY LOAM	ROCK OUTCROP	SILT LOAM TO LOAM	LOAMY SAND TO FINE SANDY LOAM	PEAT AND MUCK
AMOUNT OF AVAILABLE MOISTURE	INTERMEDIATE TO MODERATELY HIGH	INTERMEDIATE TO MODERATELY HIGH	INTERMEDIATE TO PERIODICALLY EXCESSIVE	INTERMEDIATE	LOW TO INTERMEDIATE	VARIABLE	LOW TO INTERMEDIATE	PREVAILINGLY LOW	GENERALLY EXCESSIVE
RELATIVE NATURAL FERTILITY	PREVAILINGLY HIGH	INTERMEDIATE TO MODERATELY HIGH	MODERATELY HIGH TO HIGH	INTERMEDIATE	LOW TO INTERMEDIATE	VARIABLE	INTERMEDIATE TO MODERATELY HIGH	PREVAILINGLY LOW	VARIABLE
VIRGIN FOREST GROWTH	HARDWOODS	HARDWOODS OR HARDWOODS & PINE	HARDWOODS	CHIEFLY HARDWOODS	PINE	PINE AND HARDWOODS	CHIEFLY PINE	PINE	CHIEFLY SWAMP CONIFERS PARTLY SEDGES SPHAGNUM LEATHER LEAF
LOCAL NAME	IRON RIVER HARDWOOD UPLANDS	AMASA HARDWOOD PINE UPLANDS	BARAGA HARDWOOD HIGHLANDS	WATERSMEET HARDWOOD UPLANDS	MASTODON PINE HILLS	CRYSTAL FALLS ROCK KNOBS	PENTOGA PINE PLAINS	PANOLA PINE PLAINS	SWAMPS, MARSHES AND BOGS

FIGURE 2.—Natural land divisions of Iron County, Mich.

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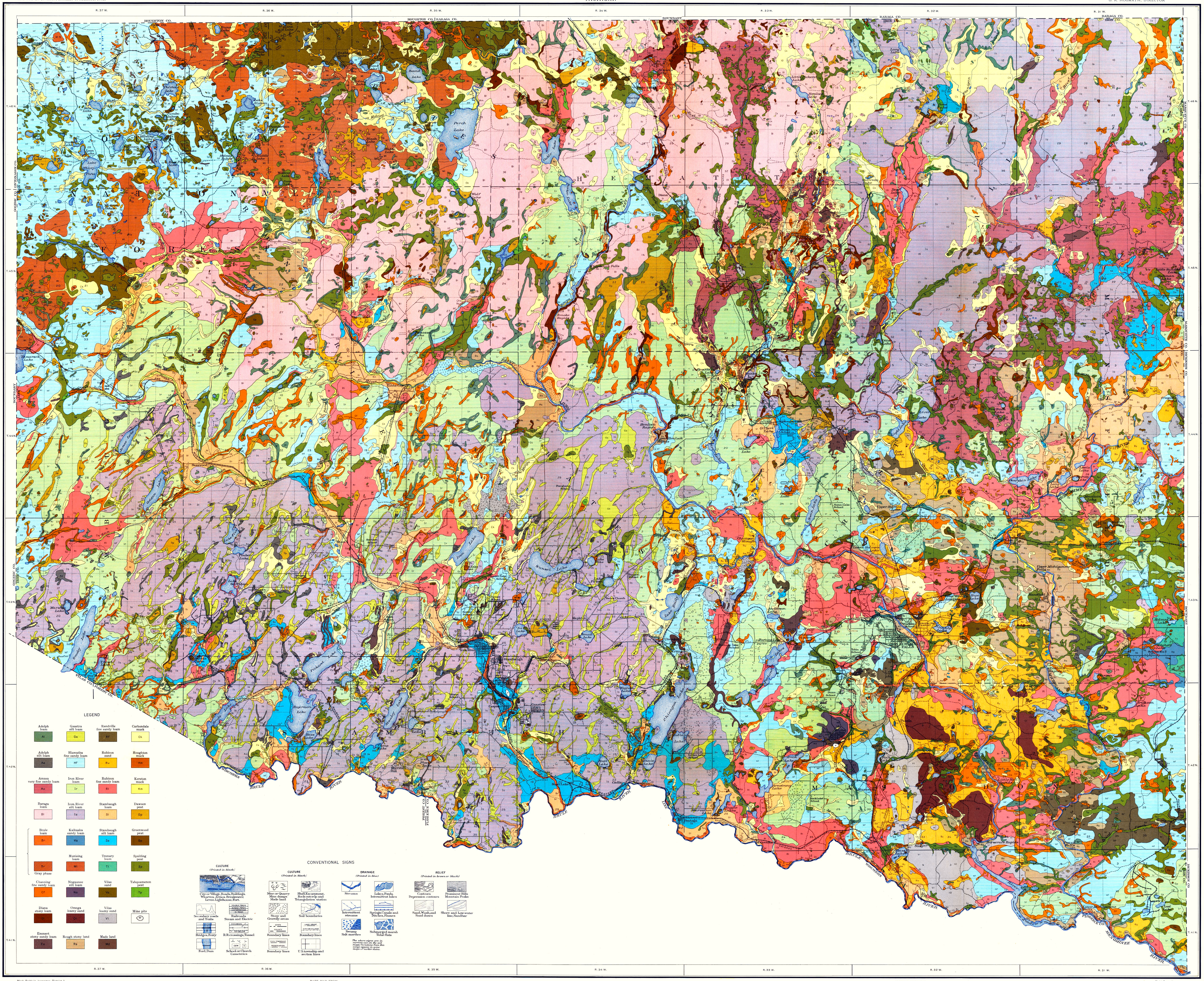
U. S. DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
HENRY G. KNIGHT, CHIEF
SOIL SURVEY DIVISION, CHARLES E. KELLOGG, CHIEF

SOIL MAP
IRON COUNTY
MICHIGAN

MICHIGAN AGRICULTURAL EXPERIMENT STATION
V. R. GARDNER, DIRECTOR
C. E. MILLAR, IN CHARGE SOIL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
G. R. HOGARTH, DIRECTOR



Mark Baldwin, Inspector, District 1.
Soils surveyed by Z. C. Foster, U. S. Department of Agriculture, in charge, and J. O. Veatch, Michigan Agricultural Experiment Station, and L. R. Schoenmann, Michigan Department of Conservation.

BASE MAP FROM
MICHIGAN DEPARTMENT OF CONSERVATION,
LAND-ECONOMIC SURVEY

Scale 1 inch-1 mile

Field Operations
Bureau of Chemistry and Soils
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